# Hmwk 13 (Supp)

(3) Laplace in Spherical $V(r,\theta)$

$$\frac{1}{R}\frac{d}{dr}\left(r^2\frac{dR}{dr}\right) = l(l+1)$$

use method of frobenius to show:

$$R(r) = Ar^l + Br^{-l(l+1)}$$

$$R(r) = \sum_{l=0}^{\infty} A_l r^{l+x} \quad \text{frobenius}$$

$$-l(l+1) + \frac{1}{\sum_{l=0}^{\infty} A_l r^{l+x}}\frac{d}{dr}\left(r^2\sum_{l=0}^{\infty}(l+x)A_l r^{l+x-1}\right) = 0$$

$$\sum_{l=0}^{\infty}\left(-l(l+1)A_l r^{l+x}\right) + \frac{d}{dr}\left(\sum_{l=0}^{\infty}(l+x)A_l r^{l+x+1}\right) = 0$$

$$\sum_{l=0}^{\infty}\left(-l(l+1)A_l r^{l+x}\right) + \sum_{l=0}^{\infty}(l+x)(l+x+1)A_l r^{l+x} = 0$$

$$\sum_{l=0}^{\infty}\left[-l(l+1)r^{l+x}A_l + (l+x)(l+x+1)r^{l+x}A_l\right] = 0$$

$$\sum_{l=0}^{\infty}\left[(-l^2-l)r^{l+x}A_l + (l^2+2lx+x^2+x)r^{l+x}A_l\right] = 0$$

$$\sum_{l=0}^{\infty}\left[A_l(x^2+x+2lx-l)r^{l+x}\right] = 0$$

$$\Rightarrow A_0(x^2+x)r^x + A_1(x^2+3x-1)r^{1+x} + \dots = 0$$

coefficients must $= 0$

$R(r) =$